CLAIMS

What is claimed is:

1. A method of inserting a sync code into data recorded on a disc-type recording medium, the method comprising inserting the sync code into an input data stream,

wherein the sync code includes one pattern breaking the maximum run and other patterns aligned before and after the one pattern, the length of the other patterns being the same as or larger than a value obtained by dividing the outermost circumference radius of the disc-type recording medium by the innermost circumference radius.

2. The method of claim 1, wherein a run length of the one pattern is longer by 1T than a maximum run length specified in a predetermined modulation-coding rule.

3. The method of claim 1, further comprising repeating the one pattern of the sync code at least twice.

4. The method of claim 2, wherein the other patterns are 4T long and have a plurality of different sync signal patterns, and the distance between adjacent different sync signal patterns is 2 or more.

5. The method of claim 2, wherein the other patterns are 3T long and have a plurality of different sync signal patterns.

6. The method according to claim 1, wherein the innermost circumference radius is substantially 6mm and the outermost circumference radius is substantially 22.5mm.

7. The method according to claim 6, wherein either a 2T pattern or a 4T pattern is positioned before and after a 9T-9T pattern.

8. The method according to claim 4, wherein either the sync code has a first value and a termination table is used or the sync code has a second value and the termination table is not used.

9. A method of modulating m-bit data into n-bit data to record the m-bit data on a disc-type recording medium, the method comprising:

modulating an input data stream in accordance with a predetermined modulation rule;

determining a sync code to be inserted per predetermined unit of the modulated data stream;

inserting the determined sync code into the modulated data stream; and

converting the data stream containing the sync code into nonreturn-to-zero-inverted (NRZI) data,

wherein the sync code is determined using a sync code table that stores sync codes containing one pattern breaking the maximum run and other patterns aligned before and after the one pattern, the lengths of the other patterns being the same as or larger than a value obtained by dividing the outermost circumference recording radius of the disc-type recording medium by the innermost circumference recording radius.

10. The method of claim 9, wherein the length of the one pattern is longer by 1T than the maximum run length specified in a predetermined modulation-coding rule.

11. The method of claim 9, further comprising repeating the one pattern at least twice.

12. The method of claim 10, wherein the other patterns are 4T long and have a plurality of different sync code patterns, and the distance between adjacent different sync code patterns is 2 or more.

13. The method of claim 10, wherein the other patterns are 3T long and have a plurality of different sync code patterns.

14. The method according to claim 9, wherein when modulating a 4-bit or a 8-bit code, the inserting inserts a sync code whose length is n-times longer than a length of the modulated code.

15. The method according to claim 9, wherein upon the inserting the sync code into data modulated being in accordance with a modulation rule, the sync code is determined to meet both the run length rule for RLL coding and a Repeated Minimum Transition Ratio (RMTR) limiting condition to limit a repetitive appearance of a shortest T.

16. The method according to claim 12, wherein either the sync code has a first value and a termination table is used or the sync code has a second value and the termination table is not used.

17. The method according to claim 9, wherein the innermost circumference radius is substantially 6mm and the outermost circumference radius is substantially 22.5mm.

18. The method according to claim 17, wherein either a 2T pattern or a 4T pattern is positioned before and after a 9T-9T pattern.

19. An apparatus for inserting a sync code into data recorded on a disc-type recording medium, the apparatus comprising a sync code inserter which inserts the sync code into an input data stream,

wherein the sync code includes one pattern breaking the maximum run and other patterns aligned before and after the one pattern, the lengths of the other patterns being the same as or larger than a value obtained by dividing the outermost circumference radius of the disc-type recording medium by the innermost circumference radius.

20. The apparatus of claim 19, wherein the length of the one pattern is longer by 1T than the maximum run length specified in a predetermined modulation-coding rule.

21. The apparatus of claim 19, wherein the one pattern is repeated at least twice.

22. The apparatus of claim 20, wherein the other patterns are 4T long and have a plurality of different sync signal patterns, and the distance between adjacent sync signal patterns is 2 or more.

23. The apparatus according to claim 22, wherein either the sync code has a first value of 001 000 100 000 000 100 010 and a termination table is used or the sync code has a second value of 001 000 100 000 000 100 010 and the termination table is not used.

24. The apparatus of claim 20, wherein the other patterns are 3T long and have a plurality of different sync signal patterns.

25. An apparatus for modulating m-bit data into n-bit data to record the m-bit data on a disc-type recording medium, the apparatus comprising:

a modulator modulating an input data stream in accordance with a predetermined modulation rule;

a sync code determiner determining a sync code that is to be inserted per predetermined unit of the modulated data stream;

a sync code inserter inserting the determined sync code into the modulated data stream; and

a converter converting the data stream containing the sync code into nonreturn-to-zero-inverted (NRZI) data,

wherein the sync code determiner further comprises a sync code table, and the sync code is determined using a sync code table which stores sync codes containing one pattern breaking the maximum run and other patterns aligned before and after the one pattern, the lengths of the other patterns being the same as or larger than a value obtained by dividing the outermost circumference recording radius of the disc-type recording medium by the innermost circumference recording radius, and one of the sync codes stored in the sync code table is selected as the sync code which is to be inserted into the modulated data stream.

26. The apparatus of claim 25, wherein a length of the one pattern is longer by 1T than a maximum run length specified in a predetermined modulation-coding rule.

27. The apparatus of claim 25, wherein the pattern breaking the maximum run is repeated at least twice.

28. The apparatus of claim 26, wherein the other patterns are 4T long and have a plurality of different sync code patterns, and the distance between adjacent different sync code patterns is 2 or more.

29. The apparatus of claim 26, wherein the other patterns are 3T long and have a plurality of different sync code patterns.

30. A computer-readable recording medium for recording a program executing a sync code insertion method which records a sync code in data recorded on a disc-type recording medium, wherein the method comprises inserting a sync code into an input data stream,

wherein the sync code includes one pattern breaking the maximum run and other patterns aligned before and after the one pattern, the length of the other patterns being the same as or larger than a value obtained by dividing the outermost circumference radius of a disc-type recording medium by the innermost circumference radius.

31. The medium of claim 30, wherein the run length of the one pattern is longer by 1T than the maximum run length specified in a predetermined modulation-coding rule.

32. The medium of claim 29, wherein the one pattern is repeated at least twice.

33. A computer-readable recording medium for recording a program executing a data modulation method which modulates m-bit data into n-bit data to record the m-bit data on a disc-type recording medium, wherein the method comprises:

modulating an input data stream in accordance with a predetermined modulation rule;

determining a sync code to be inserted per predetermined units of the modulated data stream;

inserting the determined sync code into the modulated data stream; and

converting the data stream containing the sync code into NRZI data,

wherein the sync code is determined using a sync code table which stores sync codes in which one pattern breaking the maximum run and other patterns is aligned before and after the one pattern, the lengths of the other patterns being the same as or larger than a value obtained by dividing the outermost circumference radius of the disc-type recording medium by the innermost circumference radius.

34. The medium of claim 33, wherein a run length of the one pattern is longer by 1T than a maximum run length specified in a predetermined modulation-coding rule.

35. The medium of claim 32, wherein the one pattern is repeated at least twice.

36. A method of detecting a sync code from both an innermost circumference and an outermost circumference of a disc-type recording medium comprising generating the sync code in consideration of a ratio of the innermost circumference radius and the outermost circumference radius.

37. The method of detecting a sync code according to 36, wherein a length of a pattern adjacent to a longest T pattern is greater than or equal to the outermost circumference radius divided by the innermost circumference radius to enable proper generation of a phase locked loop (PLL) clock.

38. An apparatus for detecting a sync code from both an innermost and an outermost circumference, comprising:

a sync code determiner to determine a pattern of the sync code; and

a sync code inserter to insert the determined pattern of the sync code into a data stream,

wherein the sync code is generated in consideration of a ratio of the innermost circumference radius, and the outermost circumference radius.

39. The apparatus according to claim 38, wherein a length of a pattern adjacent to a longest T pattern is greater than or equal to the outermost circumference radius divided by the innermost circumference radius to enable proper generation of a phase locked loop (PLL) clock.